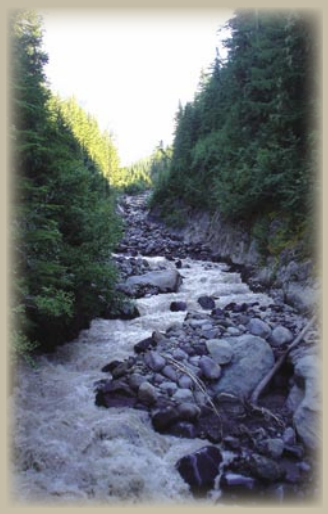
Focus Area: Over-crowded Riparian Forests

Washington State adopted some of the most stringent forest practices rules in the nation, intended to improve salmon-friendly habitat. But these rules can also impose significant burdens and costs on small and large forest landowners. The complexity of the rules often deters forest landowners from carrying out ecological practices in streamside buffers, and sometimes discourages landowners from retaining the land in forestry.

The cost of regulations is an increasingly major issue for forest landowners. On one hand, Washington's comparatively strict regulations provide many ecological benefits. Because the regulations have been developed in cooperation with the regulatory agencies and multiple stakeholders over time, they can provide a sense of stability for the forest industry and could even potentially create a competitive edge, if marketed well.

On the other hand, these costs can significantly decrease profits, especially for owners of smaller forest parcels, who have been shown to be disproportionately affected. By eliminating economic benefits, some ecological benefits also are eliminated when owners of smaller forest parcels convert their land to development. Lands developed for non-forestry uses are not subject to the same stream buffering requirements as forestry. Depending on local county-specific rules, timber can be cleared much closer to streams for the purposes of development and agriculture than for forest management.

The magnitude of management restrictions around fish-bearing streams can undermine the economics of sustainable forestry.



Over the past 12 years, there has been a 36 percent decline in harvest levels from private lands in Washington. Northern Spotted Owl reserves, riparian protection, road management, and unstable slopes have all been addressed by regulations and appear to be a major cause for these declining harvest levels.

In 2001, the Forest and Fish agreement spawned new forest practices rules to meet requirements and gain assurances of compliance with the Endangered Species Act and Clean Water Act, including the way streams are "typed" or characterized. Some streams previously characterized as non-fish-bearing are now considered fish-bearing. The "type" of stream determines the type of protection required when undertaking forest practices. There is evidence that new stream typing has substantially increased the harvest constraints from what was first estimated.

Fig. 29 - Washington State's Forest and Fish Rules
Stream Typing Classification

1975 SYSTEM	
1	FISH-BEARING
2	FISH-BEARING
3	FISH-BEARING
4	PERENNIAL NON-FISH-BEARING
5	SEASONAL NON-FISH-BEARING
9	UNKNOWN OR UNCLASSIFIED

2005 SYSTEM	
S	SHORELINE
F	FISH-BEARING
N/p	PERENNIAL NON-FISH-BEARING
N/s	SEASONAL NON-FISH-BEARING
U	UNKNOWN

These new stream types were not just new names. While streams on private lands in western Washington formerly typed as 1, 2 and 3 generally retained their fish-bearing status as new types S and F, changes for streams formerly classified as non-fish-bearing (4, 5 and 9) were substantial. Approximately 44.3 percent of old type 4; 8.7 percent of old type 5; and 13.2 percent of old type 9 moved to new types S and F. This transition to fish-bearing status greatly increased the buffer area associated with stream protection. In addition, 49.5 percent of the old type 9 streams were reclassified as new type N. These headwater streams may require buffers if they are perennial.

In comparing the new stream typing rules to the old on private lands, there was an estimated 134 percent increase in the total area affected by headwater buffers. These increases in both fish-bearing and non-fish-bearing stream mileage and associated riparian management zones can have a considerable impact on the economic viability of sustainable forest management on private lands.

While the definitions of fish-bearing and non-fish-bearing streams may be stable, the application of these definitions to stream miles is a moving target subject to changing interpretations, new stream assessment technology (such as remote sensing), and "ground-truthing". Knowledge about stream networks, as represented by a hydrography layer in DNR's Geographic Information System

(GIS), is limited by error, clarity, and the dynamic nature of stream systems. Upgrades to the hydrography layer from ground-truthing are not tracked, which creates uncertainty in the quality of existing stream data. Any assessment based on these data should be viewed with caution. Because there are many more miles of headwater streams than fish-bearing streams, the magnitude of management restrictions around these streams can undermine the economics of sustainable forestry, motivating accelerated land conversions with a consequent loss of forests and stream protections.

The new forest practices rules require a three-zone riparian harvest buffer along each side of a fish-bearing stream. The zone adjacent to the stream is a 50-foot no-harvest core zone. This is followed by the inner zone, in which two partial harvest options are allowed. In the outer zone, partial harvest is allowed with a minimum retention of 20 conifer trees per acre that are at least 12" in diameter. A 50-foot no-harvest buffer is also required around portions of non-fish-bearing streams and around sensitive features such as seeps and springs.

As a case study, it has been calculated that smaller forest landowners in Lewis County have more than 10 percent of their forested land base in buffers. Some small forest landowners have as much as 60 percent of their land in buffers while others may have none. The new rules are estimated to have increased the number of acres in headwater stream buffers in the county by an average of 56 percent on industrial forest lands and 77 percent on non-industrial private forest lands. This represents a potentially considerable loss in land value and income to landowners. For western Washington as a whole, the estimated area in forested stream buffers is 10.5 percent, varying substantially from county to county.

The economic impacts on small forestland ownerships are of particular concern, as small forest ownerships in western Washington tend to be located in lowland areas in close proximity to streams. This suggests that small forest ownerships are of particular importance for salmon recovery and also are likely to have disproportionate economic impacts compared to other forest ownership classes.

Some harvesting can occur in streamside buffers; however, the rules regarding forest practices in these zones are very complex. Many small forest landowners appear to be leaving the entire riparian zone untouched because of the complexity and additional layout costs associated with the partial harvest options for the inner and outer zones, resulting in a more severe economic impact than anticipated.

There is evidence that by thinning in these riparian areas, economic returns could be improved, characteristics that are similar to older forests could eventually be produced, and habitat would be improved. Overcrowded second growth forests of any age have reduced habitat quality, due to lower light penetration and lower structural complexity, with only smaller diameter trees available to contribute beneficial structure to streambeds.

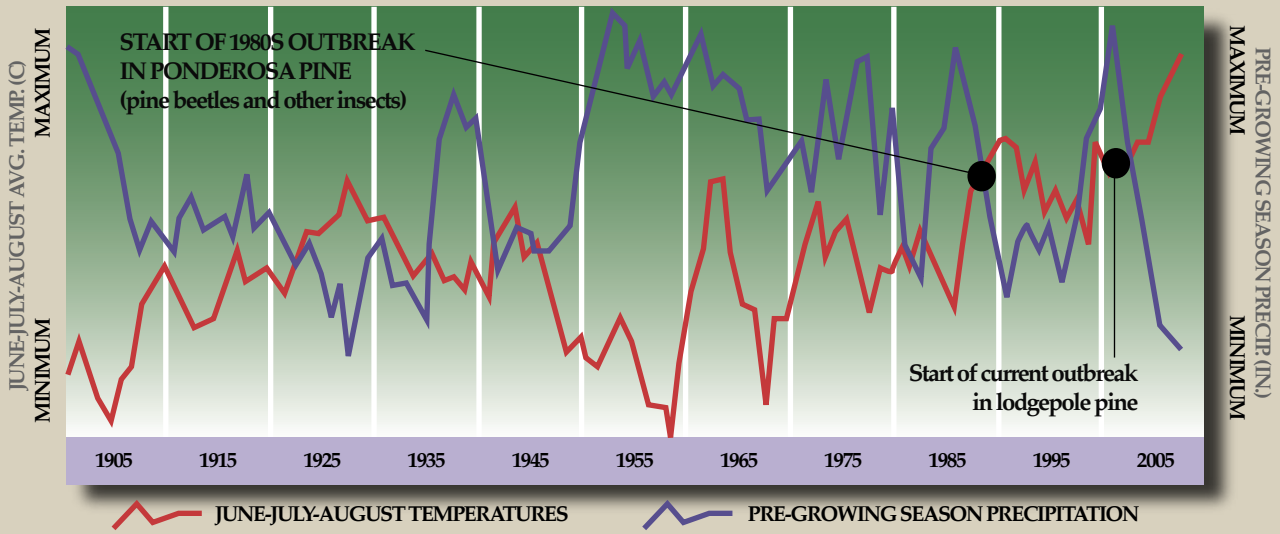
Regulations do allow landowners to propose "alternative plans" in order to reduce the economic impact, as long as the resource protection objectives are still met. Alternative plans hold the promise of keeping forest management for small forest landowners economically viable while accomplishing a substantial improvement in achieving the forest structural conditions desired along streams. Because almost all forests along streams have been commercially managed for decades, they have been planted to high densities well beyond natural stands and are very dense, unlike naturally regenerated conifer forests. Thinning in the riparian zone and helping forests grow toward characteristics similar to less crowded older forests also brings with it more viable economics. Thinning also increases the percentage of time the stand takes on characteristics similar to old forests, from about 32 percent to 67 percent, a substantial ecological gain.

Focus Area: Eastern Washington Forest Health

The eastern Washington forests that greeted early European settlers typically are pictured as dominated by widely spaced Ponderosa pine trees towering over a grassy forest floor. However, after decades of aggressive fire suppression, many of these forests are overly crowded with a large volume of small diameter, low economic-value pine and fir trees.

Today, 2 million acres of eastern Washington forests are plagued with an alarming increase in severe insect infestations, resulting in many dead and dying trees, which leads in turn to an increase in the number and severity of forest fires. High summer temperatures and decreased moisture, both outside of their 100-year historic range since 2000, contribute to record levels of infestation by the Mountain Pine Beetle. Recent research suggests that this trend will not quickly be reversed, given the even more severe epidemic in nearby British Columbia. Pine trees essentially shut down under these extreme summer conditions, which leaves them more susceptible to insect attack and infestation.

Fig. 30 - Temperature and Precipitation Trends for Eastern Washington (1899-2006)



The number of trees killed increased from 2.2 trees per acre over the past 20 years to 8.4 trees per acre in the past few years. With the increase in acres affected, the total number of trees killed is more than 20 times higher. The increase in tree deaths will likely lead to an increasing number of unnaturally severe and costly fires, with accompanying economic losses, increased emission of greenhouse gases, and threats to community safety.

National forests in eastern Washington, such as the Okanogan and Wenatchee, are most at risk, with 80 percent of the land classified as a moderate to high fire hazard. In addition to economic and safety concerns, burned forests contribute tons of carbon to the atmosphere and a legacy of dead trees that will continue to emit carbon for decades as they decompose.

Historically, frequent low-intensity grass fires cleaned out the understory, producing wide spacing between trees that contributed to greater resilience and resistance to pests and catastrophic fires. However, there is early evidence that thinning even to densities previously thought to be adequate to reduce insect attack may no longer be sufficient to prevent bark beetle infestations because of the unprecedented climatic conditions.

As a result of federal forest policies, there has been an 85 percent decrease in timber harvest in eastern Washington national forests since the late 1980s, from 431 mmbf/year between 1986 and 1989 to 65 mmbf/year between 1998 and 2002. Higher log prices caused by the decline in harvests on federal land led to an increase in timber harvests on private and tribal land that is not sustainable in the long term, and the non-federal harvest will likely decline over the next several decades. In response, several wood processing facilities along the eastern Cascades have already closed in spite of the need for an industry infrastructure that would be able to process the potentially large volume of small diameter, low value wood that would be generated from an aggressive effort to use thinning treatments to restore forest health.

This loss of processing infrastructure along the eastern Cascades translates into longer hauling distances, less competitive timber prices, and lower returns for timber investments, exactly the opposite of the desired conditions necessary to sustain active timber management, especially the needed thinning of low value small trees to help restore forest health and reduce fire risk.

A variety of options have been identified that could help address the forest health problem in eastern Washington. For instance, research is needed to understand how different species will respond to climate change and to determine appropriate

The increase in tree deaths will likely lead to an increasing number of unnaturally severe and costly fires, with accompanying economic losses, increased emission of greenhouse gases, and threats to community safety.

Thinnings and the consequent reduction in fires leads to more carbon stored in the forest and forest products rather than released into the atmosphere through burning or the use of fossil-fuel-intensive wood substitutes.

density levels and tree species that can best withstand the stresses associated with changing climatic conditions. There is concern that the current generation of mature pines may not be able to adjust to the climate change fast enough and will succumb to pine beetle attack. However, regenerating forests to pine species is still believed to be a useful strategy, as young pines are better able to adjust to drier climatic conditions.

Determining the appropriate treatments can also help reduce risk of catastrophic fires. Thinnings and the consequent reduction in fires leads to more carbon stored in the forest and forest products rather than released into the atmosphere through burning or the use of fossil-fuel-intensive wood substitutes. Carbon trading markets currently are under-developed and poorly formulated for application to forest management, but as they are developed, they could play an important role in supporting aggressive forest thinning regimes.

Thinning forests to reduce the risk of fires also reduces the costs of fighting fires. Public investment in the removal of hazardous materials that contribute to increasing fire risks can be justified by the avoidance of many future costs. The combined avoided costs of fighting fires, fatalities, facility losses, forest regeneration costs, and water losses, along with other non-market benefits such as reduced risk of smoke and fires in populated areas, appear to be substantially larger than the costs to effectively remove hazardous material. Research to verify this is needed.

As an alternative, a market mechanism to stimulate forest thinning needed to improve forest health could come in the form of sawmills or other processing facilities that are able to handle small diameter material, such as biofuel production plants. Biofuel, a renewable resource used as a substitute for fossil fuels, can include wood-based diesel or wood-based ethanol, and could use thinned forest material as a feedstock. The challenge is the absence of these kinds of facilities in the central and eastern Cascades and the lack of commitment by public and private landowners to provide a reliable supply of wood feedstock.

Focus Area: Production Infrastructure

The forestry and forest products industries have traditionally made a substantial contribution to the economy of Washington, and this continues to be true today. Despite a substantial reduction in the numbers of sawmills and plywood mills, production has actually increased due to investment in larger mills, mill expansion, and new processing technology. All this has resulted in substantial increases in productivity. For example, in 2005, the forest products industry in Washington had the second largest level of capital investment in the United States, was the second largest producer of softwood lumber and the fourth largest producer of plywood. As a result, the forest products manufacturing sector represents almost 15 percent of total manufacturing jobs in Washington.

Direct employment in the forestry and forest products sector was nearly 45,000 in 2005, while indirect employment attributed to the forestry and forest products industry was estimated to be 106,000. Employment and gross business income generated within the forestry and forest product sectors have been stable or increasing.

While employment and production have been increasing, the number of mills has been declining as the forest products industry closes inefficient mills and invests in new production technologies. The number of sawmills declined from 240 to 126 between 1991 and 2005, lumber production increased by 60 percent and Washington's share of U.S. lumber production increased from 10.3 percent to 14.2 percent. In addition, the industry has shifted from rural areas to urban areas where there is better access to major transportation routes. One trend of concern is the decline in the number of pulp mills in Washington which undermines the market for sawmill residues. This adversely impacts

There are no mills between Okanogan and Yakima Counties, a distance of 200 miles, adding substantial costs in shipping low value wood.

the economic viability of sawmills that rely upon the sale of residuals as a substantial contribution to their mill profitability.

There are several factors that influence private decisions to invest in sawmills and other processing facilities that make up the immediate market for most timber from Washington forests. One important factor is nearness to major transportation routes. This is evidenced by the regional differences in timber harvest compared to employment in the forestry sector, primarily in mill jobs. Washington's coastal and southwest regions account for 65 percent of the state's timber harvest, but only 39 percent of forest sector jobs. In contrast, the Puget Sound region provides 23 percent of the timber harvest, but accounts for 48 percent of the forest sector jobs.

Loss of processing capacity close to forests in the eastern Cascades and other rural areas restricts the market for timber harvested from forest lands in those areas, which directly affects management options for forest owners. There are no longer any mills located between central Okanogan County and central Yakima County. The distance between mills in these two locations is more than 200 miles and represents substantial transportation costs in shipping low value wood (such as that from small diameter timber and thinnings). The result will be longer hauls, less competitive bidding for timber, and lower returns for timber investments, just the opposite of what is needed to re-establish a wood processing infrastructure and restore forest health within the region. This lack of local infrastructure seriously undermines the management options available to local forest managers and results in declining forest health and increased fire risk.

However, by far the dominant factor influencing processing facility investments is reliability of a stable and sufficient supply of timber. Stability of supply is related to public and private landowner management objectives, competing uses for timber land, and the costs – including regulatory costs – of producing that supply. In Washington, large reductions in land available for timber production have already occurred. Future uncertainty relates primarily to the intentions and practices of large and small private landowners. Large private land ownerships are the dominant source of supply but that supply can fluctuate. Supply from state trust lands is viewed as potentially more stable and an important foundation to mills' financial viability. Washington is viewed as having a ready availability of forest residues that could provide raw materials for various products including engineered wood products, as well as material for energy end-uses, including wood pellets and bioenergy facilities. Recent openings and expansions of new wood processing facilities indicates an industry belief that, at least in western Washington, timber supplies will be stable or increasing in the future.

Avenues to improve the production infrastructure in Washington include diversifying the processing infrastructure; providing incentives for investment in eastern Washington wood processing facilities; developing biofuels plants that would use wood from forests to create new energy sources; reducing local regulatory biases against manufacturing and mill construction; and establishing new markets for carbon and biodiversity.

As discussed in the section on eastern Washington forest health, reductions of future fire suppression costs could provide a rationale for funding actions taken today to ensure future cost reductions, such as incentives to establish facilities for processing timber removed from unhealthy forests.

Focus Area: Ecosystem Services

Biofuels

Around the world, people are looking for alternative sources of energy to reduce their reliance on fossil fuels. Washington State has 16 million acres of unreserved forests with the potential to provide an abundant resource – "wood biomass" – that could be used as fuel for a variety of energy applications. Biomass accounts for 47 percent of U.S. renewable energy consumption and recently passed hydropower as the nation's largest single source of renewable energy. More than 50 percent of total national biomass-derived energy comes from wood residues and pulping liquors created by the forest products industry. Woody biomass is an efficient source of biofuel, twelve times more efficient than corn and twice as efficient as sugar.

Wood biomass can be a source of electrical power, with steam and heat as a byproduct, or it can be used to produce liquid and gaseous fuels to reduce reliance on fossil fuels for transportation purposes. Valuable industrial chemicals can be extracted in the process. Forest debris left over from timber harvests could be used as biofuels rather than burned in piles. Producing biofuels can provide not only green energy but also a market for the overcrowded and unmerchantable small wood that currently endangers forest health in eastern Washington. Thinning eastern Washington forests can provide wood biomass for renewable energy with an added benefit of reducing the risks and costs associated with catastrophic forest fires.

During the summer of 2006, more than 360,000 acres of mostly federal forest lands burned in eastern Washington. Fire suppression costs were in the hundreds of millions of dollars, 2 million metric tons of carbon was released to the atmosphere in smoke plumes, and more than 3 billion board feet of timber was burned – equal to more than three times the annual harvest from all landowners in eastern Washington. Thinning these forests to improve forest health and reduce risk of wildfire creates excellent opportunities for turning biomass to energy. However, in spite of state and federal policies to remove forest fuel loads and to promote the use of biomass for energy, implementation remains slow, complicated and problematic.

Carbon Markets

Markets are developing for the carbon stored in forests and may be one of the more promising ecosystem services which can help to return value to forest management.

Carbon is stored in the forest by reforesting cleared areas, by letting trees grow larger before harvests, or by not harvesting. For instance, it's calculated that extending the harvest age from 50 to 100 years in the Pacific Northwest would more than double the volume of wood biomass and carbon stored in the forest. Depending upon forest type and conditions, deferring forest harvest longer than 100 years may continue to increase the stored carbon but eventually, mortality due to natural disturbances such as windstorms, fire, and disease, accompanied by decomposition and decay will result in carbon release.

However, the carbon stored in forest biomass is only part of the forest carbon storage equation. Many different types of forest products can continue to store carbon long after trees have been harvested. While short-lived products such as paper may enter the waste stream quickly and decompose, long-lived products such as panels and lumber used in housing construction will store carbon for decades, even centuries. Research has shown that the highest leverage for reducing carbon emissions may be by producing the maximum amount of long-lived wood products so as to displace fossil-intensive building products such as steel and concrete, but this aspect of carbon accounting has yet to be recognized by carbon exchanges.

Marketable credits for increased carbon storage in forests and forest products that substitute for fossil-fuel-intensive products such as steel and concrete would provide incentives for sustainable forest management as well as mitigate greenhouse gas emissions.

Energy generation from wood-based biomass can also substitute for fossil fuels used for energy. This reduces the carbon emissions associated with the fossil fuels.

In eastern Washington, fire risk reduction treatments such as thinning can save the carbon that is emitted by fire and post-fire decomposition of decaying woody material. When these materials are converted to long-lived products or biofuels, they provide substitutes for fossil-fuel-intensive products and fuels. Some of the material may be best used as a biofuel, displacing fossil energy sources as another way to extend the carbon benefits long after the carbon leaves the forest. In addition, the destructive fires associated with excess density can cause substantial problems for forest regeneration and forest productivity, lowering post-fire growing capacity for a lengthy period of time.

Washington's timber market coexists with current and potential parallel markets: for products such as biofuel, services such as carbon storage, or real estate markets for the forest land itself. When forests are converted to non-forest uses, ecosystem services for clean water, wildlife habitat, and carbon retention are lost. Pricing and paying for such services would give additional incentives to landowners to sustain the land in forestry. However, pricing values such as diverse wildlife habitat or atmospheric carbon depend upon the creation of new markets, often in response to governmental policy such as carbon cap and trade credits or habitat banking.

Marketable credits for increased carbon storage in forests and forest products that substitute for fossil-fuel-intensive products such as steel and concrete would provide incentives for sustainable forest management as well as mitigate greenhouse gas emissions.

Energy generation from wood-based biomass can also substitute for fossil fuels used for energy. This reduces the carbon emissions associated with the fossil fuels.